ABSTRACT

A yaw stability system for a vehicle as well as methods for controlling yaw in a vehicle and estimating the retarding torque of an electromagnetic retarder. The yaw stability system includes a yaw rate sensor, a plurality of braking devices, and a control unit. The control unit communicates with the yaw rate sensor and is configured to identify a desired yaw rate, select one or more of the plurality of braking devices based on a yaw condition, and communicate a control command to one or more of the selected braking devices to induce a control yaw moment. The method for controlling yaw includes determining a vehicle yaw rate and desired yaw rate, calculating a yaw rate error, determining a control yaw moment using a sliding mode control law based on a lumped mass vehicle model, selecting one of the braking devices based on a vehicle yaw condition, determining a control command based on the control yaw moment, and communicating the control command to one of the selected braking devices. The method of estimating retarding torque includes modeling the estimated retarding torque based on a quadratic function of a control element velocity and a magnitude of a retarder excitation current as well as estimating coefficient functions of the quadratic relationship from steady state test data performed at various rotor speeds.